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GAS ABSTRACTS

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1. GAS INDUSTRY

Legislation to Curb FPC

Ralph, H. D. LEGISLATION CURBING FPC GATHERS WIDESPREAD INDUSTRY SUPPORT. *Oil Gas J.* 45, 37-38 (1947) *March* 8.

Legislation introduced in both houses of Congress recently would revise the Natural Gas Act to curb the power of the FPC over the natural gas industry. The legislation would prevent FPC from (1) controlling "end use" to which gas is put, (2) regulating production and gathering of natural gas, (3) regulating direct sales to industrial consumer and (4) regulating local distribution of gas.

R. S. Goodrick

Natural Gas Pipeline

FPC OKEHS NATURAL GAS PIPELINE, TEXOMA ADDITIONS. *Gas Age* 99, 52 (1947) *February* 20.

The Federal Power Commission has issued a certificate of public convenience and necessity to the Natural Gas Pipeline Co. of America and Texoma Natural Gas Co. authorizing construction of additions to their gas transmission facilities operated as an integrated natural gas transmission system extending from the Panhandle Field in Texas and supplying market areas in Indiana, Iowa, Kansas, Nebraska, Wisconsin and Illinois. The aggregate cost of the facilities is estimated at $23,493,987. With the installation of these facilities, to be completed about Jan. 1, 1949, Natural will have a capacity of about 484,000,000 cu. ft. to meet estimated peak day sales requirements of its utility customers, including Chicago District Pipeline Co.

Excerpt from article

Petroleum Research

Power, H. H. PETROLEUM SUBSTITUTES: PAST AND PRESENT RESEARCH, DEVELOPMENT AND ECONOMICS. *Petroleum Engr.* 18, 70, 72, 75, 78, 80, 82, 84 (1947) *February.*

The development of coal hydrogenation, coal carbonizations, shale oil distillation, tar sand extraction and Fischer-Tropsch synthesis is traced broadly. The need for government and other research programs directed toward petroleum substitutes is emphasized.

C. H. Riesz

Reserves

RESERVES PLACED AT 24,194,587,000 BBL. IN A.P.I., A.G.A. JOINT REPORT. *Oil Gas J.* 45, 44 (1947) *March* 8.

Data are given for proved liquid hydrocarbon and proved natural gas reserves.

R. S. Goodrick

Reserves

Deegan, C. J. LIGHT HYDROCARBONS TO FORE IN NEW A.P.I. METHOD OF ESTIMATING RESERVES. *Oil Gas J.* 45, 136-137 (1947) *March* 22.

This article analyzes the recent A.P.I.-A.G.A. joint report on crude-oil and light-hydrocarbon proven reserves and answers the questions about those reports that have been most frequently asked by oil men.

Author's abstract

Safety

Breeland, A. W. ACCIDENTAL IGNITION OF GAS. *Am. Gas J.* 166, 29-30 (1947) *February.*

In this paper, which was presented at a meeting of the National Safety Council at Chicago, Illinois, October 8 to 11, 1946, methods are given for avoiding fires and explosions in construction and repair of gas lines. The steps in this safety program are: (1) Correct design of all equipment and facilities. (2) Thorough

training of all employees in the jobs to which they are assigned. (3) Provision of proper tools and equipment. (4) Plan of procedure which will insure that all of these steps are carried out.

S. Dean

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2. APPLIANCES

Air Conditioning Unit

York, J. E. COIL SELECTION OF AIR CONDITIONING UNIT. *Heating & Ventilating* **44, 66-75 (1947)** ***March.***

A stepwise method for determining the cooling load and for selecting cooling coils for any proposed air conditioning installation is presented. Illustrative examples are given for use of a refrigerant or chilled water as the cooling medium.

E. F. Davis

Appliance Changeover

Ray, P. A. KEYS TO APPLIANCE CHANGE-OVERS. BURNER PORT CHART AND ORIFICE TABLE. *Butane-Propane News* **9, 39-48 (1947)** ***March.***

The article relates a simplified graphical method of solving some of the gas interchangeability problems for domestic appliances. From the graph the number of burner ports and their drill size may be determined when the Btu input rate of the burner and the most desirable port loading of the gas to be used are known. A table is given for determining the orifice drill size of the standard, giant and oven burners of various manufactured ranges when using propane or butane-air mixtures, propane-butane mixtures or natural gas.

E. F. Davis

Continuous Bake Oven

Helme, W. GAS FIRES COOKIE "ASSEMBLY LINE." *Gas* **23, 46-47 (1947)** *February.*

A description is given of the streamlined gas-fired continuous bake oven in operation at the plant of the Salerno Magowan Biscuit Co., at Chicago. The speed of the endless steel band that serves as hearth may be regulated to vary from 2½ to 11 minutes the time required to pass the dough through the four independently heated and regulated baking zones. Thus cookies and crackers of various sorts may be baked at any required condition of time and temperature.

S. Dean

"CP" Ranges

Berno, P. I. BUILDING BETTER "CP" GAS RANGES. *Am. Gas Assoc. Monthly* **29, 121-124, 155-156 (1947)** ***March.***

This article is a review of the things that are being done under the "CP" program to improve and perfect the gas range and thus keep gas in the lead as a cooking fuel. Some of the aspects of research being conducted by the Domestic Gas Research Committee of A.G.A. and by manufacturers are better stove frame construction, improved performance of all burners, automatic ignition of all burners with thermostatic control of oven and broiler, and kitchen ventilation.

S. Dean

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3. COMBUSTION AND INDUSTRIAL FURNACES

Controlled Atmospheres

deCoriolis, E. G. THE GROWING USE AND IMPORTANCE OF PREPARED ATMOSPHERES. *Industrial Heating* **14, 226-234 (1947)** *February.*

Fields of application of controlled atmospheres, especially in the metal industries, are discussed in this article from a paper presented at the recent American Gas Association Sales Conference on Industrial and Commercial Gas, in Toledo, Ohio. Special reference is made to carbon restoration, prevention of decarburization, gas quenching, dry cyaniding, and dew-point control.

Author's abstract

Smokeless Combustion of Gases

Brumbaugh, A. K., Jr. SMOKELESS BURNING OF REFINERY VENT GASES. *Oil Gas J.* 45, 126-129, 134 (1947) *February* 22; *Petroleum Processing* 2, 168-170 (1947) *March; Petroleum Refiner* 26, 111-114 (1947) *March.*

To abate any "smog" conditions at its Torrence, California refinery, General Petroleum Corp. developed a system for burning waste gases by the use of a venturi-type aspirating burner. For burning isobutane vapors, for example, a ratio of venturi throat area to gas-orifice area of 4 to 1 was found adequate; with up to about 20 per cent of vaporized hydrocarbons in the gases it was found necessary to increase this ratio to 16 to 1. Flame did not "pop back" to the gas orifice at gas pressures as low as ⅛ psig. A series of burners of different sizes were installed, controlled automatically to go into and out of service as gas pressure varies. The installation has given satisfaction in eliminating smoke nuisance.

Author's abstract

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4. CARBONIZATION AND GASIFICATION

High Pressure Gasification

Weir, H. M. HIGH PRESSURE GASIFICATION OF COAL IN GERMANY. *Ind. Eng. Chem.* 39, 48-54 (1947) *January.*

This paper describes and gives some operating data on the German Lurgi Process, employing oxygen of 95% or higher purity for the continuous gasification of coal under a pressure of about 20 atm. About 1/16-⅜ inch size fragments of briquets made by low temperature carbonization of brown coal, often mixed with small size brown coal or other noncoking coals, were used to make up the 3-7 ft. deep fuel bed in the generator. Material of 30% ash content and up to 25% water content can be handled satisfactorily. With steam preheated to about 1000°F. and a generator bed temperature of 1900-2000°F., at a plant in Boehlen (1944), a 475 Btu gas, containing about 21% CH_4, 52% H_2, 18% CO and 7% CO_2 was made after the raw gas had been scrubbed for the removal of the bulk of the original 32% CO_2 in the gas produced. About 155 cu.ft. of pure oxygen, 85 lb. of steam and 9.4 kw. hr. of electric power were consumed per Mcf of purified gas made. Additional operating data and cost figures from large scale operation are given. As to possible application of the process in this country, the installation of Lurgi generators to coal mines, where their proximity to the point of consumption would allow piping the gas without any pressure boosting, is suggested.

J.J.S. Sebastian

Low Temperature Carbonization

Schmidt, L. D. LOW TEMPERATURE COKE BY THE KRUPP-LURGI PROCESS. *U. S. Bureau of Mines I. C.* 7395, 1-18 (1947) *February.*

A complete description is given of the design and operation of the Krupp-Lurgi Low-Temperature Carbonization Process. Several such plants have been built in Germany since 1936 for the production of a smokeless fuel from a wide variety of cheap bituminous coals for use in household stoves, locomotives, gas producers on automobiles and in blue gas generators for making synthesis gas. Six carbonization cells, each 10.5 ft. long, 6.9 ft. high, 3 in. wide at the top and 4 in. wide at the bottom constitute an oven in which 3.24 tons of coal is carbonized in 5-6 hours at 1100°F. The cells are separated by heating flues through which hot gases, issu-

ing from a burner using a lean gas or part of the gas produced, are circulated by means of a blower. The latter simultaneously recycles most of the combustion products to which hot combustion gases are added. A highly reactive, easily ignited low temperature coke of 50% porosity and 8-10% volatile matter is thus produced. This method of carbonizing coals in a static state, while confined in a narrow space between stationary, indirectly heated steel walls, permits a precise temperature control and is claimed to yield a stronger and better smokeless fuel than that produced by means of rotating drums or ovens. A valuable heavy tar, about 6-8 lb. per 100 lb. of dry coal, is produced as a by-product. Available data on investment and operating costs indicate that plants similar to the Krupp-Lurgi might prove practicable in this country.

J.J.S. Sebastian

Organic Sulfur Removal

Egerton, A.C.G. REMOVAL OF ORGANIC SULFUR AND UNSATURATED HYDROCARBONS FROM COAL GAS. *British* 578, 872 (1946) *July* 16.

Unsaturated hydrocarbons and organic sulfur compounds such as C_2H_4 and CS_2, are removed from coal gas by scrubbing with liquid CH_4 at atmospheric pressure. The gases are first treated to remove CO_2, H_2O, and H_2S and then passed through a heat exchanger cooled with purified gas. The gas is further cooled by liquid CH_4 in a condenser, passed through a scrubber countercurrent to liquid CH_4, and finally through the cold side of the heat exchanger. In one example the unsaturates in a cold gas were reduced from 3.5 to 0.5% and the organic sulfur from 29 to 0.5 grains per 100 cu.ft. of gas. With more efficient scrubbing, final concentrations as low as 0.1% unsaturates and 0.1 grains per 100 cu.ft. are possible.

C.A. 41, 1414 (1947) March 10.

Organic Sulfur Removal

Key, A. REMOVING ORGANIC SULFUR FROM COAL GASES. *British* 580, 474 (1946) *September* 9.

Organic sulfur compounds in coal or coke gas are converted to H_2S and subsequently removed by the addition of at least 5% steam and passing over a catalyst consisting of Cr, Cr oxide or Cr sulfide on activated carbon. Optimum temperatures are from 250 to 350°C. Better conversions may be obtained by using larger quantities of steam and by previously removing H_2S. Steam present in the gas as a result of the gasification process may be utilized. The reactions occurring may be represented as follows: $COS + H_2 \rightarrow CO + H_2S$ and $COS + H_2O \rightleftarrows CO_2 + H_2S$. Preparation of the catalyst, and conditions of temperature and space velocity are described in British 561, 679 (C.A. 40, 197). One test indicates that a gas, originally containing 25 grains of organically combined S per 100 cu.ft., 250 grains of H_2S, and 30% steam, had a final S content of 1.1 grains after passing over the catalyst at 300°C. with a space velocity of 2000, and after removal of steam and H_2S.

C.A. 41, 1414 (1947) March 10.

Temperature Measurement in Retorts

Heaton, E. and Green, A. T. MEASUREMENT OF TEMPERATURES IN GAS RETORTS. *Gas J.* (British) 249, 151-155 (1947) *January* 15; 207-210 (1947) *January* 22.

Temperature surveys have been made in horizontal and continuous vertical retorts with the objective of improving the useful life of the refractories of construction. Considerable fluctuations in the temperature of the surface of the brickwork, due to variations in coking properties of the coal used, cause distintegration of the top fireclay bricks, flaking of the silica bricks in the upper portion and slagging of the silica bricks towards the bottom of vertical retorts. These can be prevented, if the extent of temperature variations are determined and

evaluated, by a proper selection of the refractories used. Using base-metal multiple thermocouple units enclosed in iron and sillimanite wells, variations of ± 360°F., ± 720°F. and ± 180°F. have been found in the top fireclay zone, in the charge in contact with the wall and in the bottom zone, respectively. Under these conditions harmful stretches can arise in the surface of the silica work. Considerably more work is necessary to ascertain the effect of these factors on the durability.

J. J. S. Sebastian

Underground Gasification

Sellers, G. GASIFICATION OF COAL UNDERGROUND. FUNDAMENTAL DIFFICULTIES. *Gas World* (British) 126, 217-219 (1947) *February.*

The fundamental difficulties attending four different methods used for the underground gasification of coal are discussed. The four methods thus analyzed are: (1) The "chamber method," which utilizes one of the principal methods of normally mining a coal seam by rooms and pillars, failed because the caving of the roof left cavities through which the air travelled without making contact with the coal, which then cooled off. (2) The "parallel gallery" method, using two ducts about 100 yards apart connected by a series of boreholes in which the gasification takes place, was found rather wasteful as it left large quantities of coal unconsumed and the cost of the initial work was comparatively heavy. (3) The "radial borehole" method, consisting of radially drilled boreholes extending like shafts vertically down to the coal seam and connected in the seam by horizontal boreholes made by burning the coal with a compressed air jet, also left tremendous quantities of carbonized coal underground and was restricted to horizontal seams. (4) The "sloping seam method," in which air is blown in through a middle slant opening connected by a cross gallery to two outer slant openings through which the gaseous products are drawn off, has proved to be the most successful yet tried, but even in this large quantities of coal are lost.—Various factors affecting the results of underground gasification are discussed. The conclusion is made that underground gasification does not seem economical for high grade coals in rich seams, but it has strong possibilities for inferior seams. One possible application may be the synthesis of motor fuel from the gas thus produced.

J. J. S. Sebastian

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5. NATURAL GAS AND NATURAL GAS CONDENSATES

Casinghead Gas

Gibbon, A. UTILIZATION AND CONSERVATION OF CASINGHEAD GAS. *Oil Weekly* 124, 28-36 (1947) *February* 17.

Casinghead gas is commonly thought of as all gas obtained coincident to the production of oil, although it should strictly apply to dissolved gas exclusive of associated (gas cap) gas. Its production and conservation are geared to the production of oil so that fuel conservation is not always economical. Because of certain unfavorable conditions such as low pressure and fluctuating production rate it is not always highly desirable to gas pipeline companies. Further, laying pipelines and erecting gasoline plants involve considerable capital investment. Also, gas price at the well is too low. Thus, the average oil well in Texas during 1945 realized only 60c/day from gas sales. Gas injection has proved to be highly desirable in increasing well output especially where there is no water drive in the reservoir. Thus, it decreases fluid viscosity and aids in lifting due to lowered density and to the energy of expansion. Unitized field operation together with gas injection is extremely desirable for avoiding waste of both oil and gas. The practice may now be enforced in Oklahoma under certain conditions.

J. D. Parent

Centrifugal Compressors

Shaw, M. C. and Newbauer, E. T. CENTRIFUGAL COMPRESSORS FOR GAS PIPE LINES. *Oil Gas J.* 45, 65-69, 90-94 (1947) *March* 8.

The possibility of using centrifugal compressors in the transfer of natural gas in pipelines is discussed impartially. The conclusion reached is that further study is warranted.

J. D. Parent

Continuous Flow Gas Lift

Bobo, R. A. EFFICIENT CONTINUOUS FLOW GAS LIFT. *Oil Weekly* 125, 34-38 (1947) *March* 17.

It is pointed out that natural gas is now used for lifting fluid from wells. An analysis of this process is presented. Thus it is shown that the injected gas decreases the density of the fluid so that greater lifting can be done. From the increased lift and the production rate the useful work can be evaluated. Sources of energy waste are discussed. The author estimates that gas can be compressed for 2 to 3 cents per Mcf and that a barrel of liquid can be lifted 1000 feet by less than 200 cu. ft. of gas. From this it is seen that the cost per barrel per thousand feet of lift should not be more than 6 mills if there is no salt water. If the well is making 99% salt water the cost would be 60 cents. It is said that in the Midway field of San Patricio county wells that make 95-98% water are being lifted profitably.

J. D. Parent

Estimating Maximum Sendout

King, T. FORECASTING THE MAXIMUM DAYS GAS SENDOUT. *Gas Age* 99, 21-23 (1947) *March* 6.

The author describes a method for estimating the probable and possible days of maximum sendout for gas. The method makes use of company's records of sendout for data on base load independent of the heating load, the increment in demand per degree day, and its behavior as the temperature decreases. Local weather bureau statistics are used for temperature and wind velocity records.

J. J. First

Gas Well Back Pressure

Capshaw, E. FUNDAMENTALS OF GAS WELL BACK-PRESSURE TESTING. *Oil Weekly* 125, 56-58, 61 (1947) *March* 10.

Errors in testing of wells for back-pressure are discussed and proper procedures are stated.

J. D. Parent

LP-Gases

Carpenter, F. T. DESIGN FUNDAMENTALS FOR UTILITY USE OF LP-GASES. *Gas Age* 99, 29-31, 58, 62 (1947) *February* 20.

Some general safety precautions for the handling of LP-gases are given in this article. Characteristics of LP-gases, as well as problems encountered in the transportation, storage, vaporization, mixing and distribution are included.

E. F. Davis

Natural Gas Storage

Claxton, C. R., Markle, M. G., and Meilert, D. V. NATURAL GAS STORED IN BURIED PIPE AT 2240 LBS. *Oil Gas J.* 45, 60, 63-64 (1947) *March* 1; *Gas Age* 99, 26-27, 76 (1947) *March* 6; *Am. Gas. J.* 166, 13-15 (1947) *March.*

The Public Service Co. of Northern Illinois has put a rather unique storage system in service in Kankakee, Ill. It consists of 50 lengths of 24″ pipe each about 40 ft. long. Total capacity is about 1250 Mcf and storage pressure is 2240 psi, which corresponds roughly to the most favorable compressibility factor. Each unit is wedged down to take 1½ inch specially threaded nipples. Accessories include a compressor, regulators to decrease the pressure in three steps, a boiler and heat exchanger for use in depressurizing the gas.

J. D. Parent

Permeability Determination

Calhoun, J. C., Jr. NEW METHOD TO DETERMINE PERMEABILITY. *Petroleum Eng.* 18, 103 (1947) *February.*

The author has developed an apparatus for the measurement of permeability of a core sample to gases. Equations are presented to justify the procedure. Results obtained bear out previous work in that the permeability varies inversely as the mean pressure of the gas. It is also shown that it varies with the nature of the gas and that the infinite pressure value is the same for all gases and liquids.

J. D. Parent

Pressure Maintenance

Williams, N. PRESSURE MAINTENANCE AT RICHARD KING DESIGNED TO HANDLE APPROXIMATELY 3,000,000 CU. FT. OF GAS DAILY. *Oil Gas J.* 45, 76-77, 90 (1947) *February* 15.

A flow sheet is presented for Southern Minerals Corporation's pressure maintenance plant in the Richard King field. The plant is designed for 3 MMcf of injection gas per day. Allowance is made for repressuring as well as recycling. The pressure on the particular reservoir had dropped from 2,350 psi to 1,720 psi.

J. D. Parent

Processing Natural Gas

Pryor, C. C. PROCESSING HIGH HYDROGEN SULFIDE CONTENT NATURAL GAS. *Petroleum Refiner* 26, 103-106 (1947) *March.*

A description of the hydrocarbon recovery section of the plant at McKamie field is given. Operating data and yields are presented in some detail.

Abstractor's Comment: The recovery of sulfur from this gas is described by G. Weber in *Oil Gas J.* 45, 58-59, 84, 87 (1947) *March* 8, abstracted in this section.

H. R. Batchelder

Purging Gas Holders

Silver, L. THE PURGING OF GAS PLANT AND HOLDERS. *Gas J. (British)* 249, 317-318, 321 (1947) *February* 5; 374, 377-380 (1947) *February* 12.

A discussion is presented of explosive limits and the calculation of inert gas requirements for purging, together with suggested procedures, which are drawn largely from American publications and practice.

H. R. Batchelder

Sulfur Recovery from Sour Gas

Weber, G. SULFUR FROM SOUR GAS . . . AN ADDED INCOME. *Oil Gas J.* 45, 58-59, 84, 87 (1947) *March* 8.

A description of the sulfur recovery process used at the McKamie field in southern Arkansas where hydrogen sulfide concentrations of over 4000 grains per 100 cu. ft. are encountered. The hydrogen sulfide is removed by the Girbotol process, and the sweetened gas stripped of butanes and casinghead. The recovered hydrogen sulfide is burned with enough air to convert about one third to sulfur dioxide. The resultant mixture is passed over a catalyst to promote the reaction $2H_2S+SO_2 \rightarrow 2H_2O+S$, then into a tower where it is scrubbed by molten sulfur. The recovered sulfur is pumped to a stockpile and allowed to solidify. Recovered sulfur amounts to over one fourth of the total value of all products from the raw gas. The plants of this type are estimated to cost about $5000 per ton per day capacity. The McKamie plant recovers about 60 tons per day, but the author estimates that the thirty tons per day will justify a separate plant and lower capacities can be handled profitably in a unit integrated with the gasoline plant.

Abstractor's Comments: The hydrocarbon recovery is described by C. C. Pryor in *Petroleum Refiner* 26, 103-106 (1947) *March*, abstracted in this section.

H. R. Batchelder

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Fluid Catalyst Regeneration

Hagerbaumer, W. A. and Lee, R. COMBUSTION OF COKE DEPOSIT ON SYNTHETIC BEAD CRACKING CATALYST. *Oil Gas J.* **45**, 76-80, 97 (1947) *March* 15.

The stagewise combustion of coke deposits from flowing beds of cracking catalysts has been investigated. The major process variables affecting the rate of carbon burning were found to be oxygen concentration, temperature, and the concentration and distribution of carbon on the catalyst particles. The effects of these variables have been correlated by graphical methods. Data for regenerating bead catalyst are presented and discussed. The correlated data have been applied successfully in designing kilns for commercial T.C.C. units.

Author's abstract

Fluid Catalyst Regeneration

Snuggs, J. F. REGENERATION OF SPENT CATALYST IN FLUID CATALYTIC CRACKING. *Oil Gas J.* **45**, 88-91 (1947) *March* 15; *Petroleum Refiner* **26**, 107-110 (1947) *March.*

Catalyst withdrawn from the reactor is stripped with steam to remove volatile hydrocarbons and leaves a coke deposit which may vary from less than 1 to more than 2% depending upon operating conditions. The composition of the coke is 87-93% carbon and 13-7% hydrogen. The catalyst is regenerated by passage of air through a bed of suspended catalyst, 10 to 15 feet in depth, and a gas velocity of about 1-5 feet per second. With a residence time of 10 to 20 minutes, regenerated catalyst is obtained with a residual coke deposit of 0.3 to 0.7% by weight. The flue gas from regeneration contains CO_2 and CO in relative amounts varying from 50:50 to 65:35, the presence of iron contamination of the catalyst tending to increase the ratio. Because of the possibility of uncontrolled combustion of CO at the top of the regenerator, emergency water sprays are available for quenching. Up to 65-70% of the heat of regeneration is recoverable in the form of steam. Typical commercial operating data are presented.

C. H. Riesz

High Pressure Recovery

Nelly, H. M., Jr., Canfield, R., and Sullivan, T. E. WORLD'S LARGEST PRESSURE MAINTENANCE AND HIGH PRESSURE RECOVERY PLANT. *Gas* **23**, 36-39 (1947) *February.*

In order to recover the maximum amount of light oil from high pressure distillate fields absorption systems operating at pressures as high as 1800 psi are now in use. Such plants were originally designed to recover about 90% pentanes and only 40 to 50% butanes. J. F. Pritchard has built a plant for J. S. Abercombie and the Magnolia Petroleum Co. to handle 350 MMcf/day of "wet" gas and to recover 90% of the normal butane and nearly all of the isobutane and higher hydrocarbons. Products are propane, normal butane, isobutane, isopentane and isopentane-free gasoline. Absorbers, in series, operate at 1800, 1250, 500, 150 and 50 psi and use a double scrubbing oil system. In order to increase recovery a lean oil of relatively low molecular weight is used. This light lean oil is introduced as a side stream while a lean oil of higher molecular weight is introduced at the top of the scrubber to minimize loss of the lighter oil. There is some complication in the process but it is felt that the process is more economical in larger sizes. A flow sheet and gas analyses to and from scrubbers are given.

J. D. Parent

Hydrogenation of Coal and Tar

Gordon, K. PROGRESS IN THE HYDROGENATION OF COAL AND TAR. *J. Inst. Fuel (British)* **20**, 42-58 (1946) *December.*

Following a brief history of the hydrogenation plant at Billingham from 1935, the technical

details of operation during the war years are presented. Production of hydrogen by means of the methane-steam reaction was discontinued due to lack of hydrocarbon gases. Coal hydrogenation was discontinued in 1939 and creosote hydrogenation used throughout the war along with petroleum oil hydrogenation. Two-stage vapor-phase hydrogenation was extensively employed to produce 78-80 octane fuel. A valuable consequence of this procedure was that the butanes produced in the second stage "splitting" were largely isobutane (70-75%) and was independent of the nature of the feed stock. Dehydrogenation of the butane followed by polymerization and hydrogenation of the dimer was used to make aviation gasoline. "Victane", a rich mixture component of aviation gasoline, was produced by the alkylation of benzene with butenes.

C. H. Riesz

Mercaptan Removal

Mann, G. L. TECHNOLOGY, OPERATION, AND RESULTS FROM LINDE COPPER SWEETENING PROCESS. *Oil Gas J.* 45, 195-202 (1947) *March* 23.

The process for oxidizing mercaptans in light distillates to disulfides, etc., by means of copper chloride and molecular oxygen, with subsequent reactivation of the reagent has been in use for several years and shows advantages over the older, widely used doctor sweetening process. Oxygen is added to a copper chloride-clay-water slurry for the purpose of regenerating the chloride reagent continuously. For each 0.01 per cent of mercaptan sulfur in the distillate 0.10 cu. ft. of oxygen is added per barrel of distillate processed. Two methods for removing all traces of copper compounds from the treated hydrocarbons are discussed.

Author's abstract

Octane Number of Naphtha Fractions

Ward, C. C., Gooding, R. M. and Eccleston, B. H. SUPERFRACTIONATION STUDIES. COMPOSITION AND OCTANE NUMBERS OF 0.5% FRACTIONS OF AN OKLAHOMA CITY NAPHTHA. *Ind. Eng. Chem.* 39, 105-109 (1947) *January.*

One hundred gallons of naphtha representing 12% of an Oklahoma City crude oil were superfractionated in a still having the equivalent of 80 to 90 theoretical plates. Octane numbers of various fractions and combinations were determined.

C. H. Riesz

Synthetic Gasoline

Roberts, G., Jr. and Phinney, J. A. MANUFACTURE OF SYNTHETIC GASOLINE NEARING COMMERCIAL APPLICATION IN U. S. *Oil Gas J.* 45, 72-73, 139, 141 (1947) *March* 15.

Plans for the installation of at least two synthetic oil plants are being considered. One is to be built at Brownsville, Texas, by Carthage Hydrocol, Inc., and the second is one being contemplated by Standard Oil and Gas Company in the Hugoton field of Kansas. These plants represent considerable improvements over the German plants and the features of American engineering are described. Synthesis gas prepared from natural gas by partial combustion with oxygen and the fluidized catalyst technique are outstanding developments. The investment cost for a synthetic oil plant is estimated at $3000 to $5000 per barrel of daily capacity in contrast to the German cost of $7500 to $8000.

C. H. Riesz

Toluene ex Naphthas

Coulson, E. A., Handley, R., Holt, E. C. and Stonestreet, D. A. PRODUCTION OF TOLUENE BY THE CRACKING OF SOLVENT NAPHTHA AND XYLOLES IN HYDROGEN. PART I.—EXPERIMENTS AT ATMOSPHERIC PRESSURES. *J. Soc. Chem. Ind.* 65, 396-398 (1946) *December.*

Toluene was produced from light solvent naphthas or crude xylene fractions by passage over various contact materials contained in a silica tube at temperatures above 700°C. In the presence of hydrogen, silver gauze at 750°C. produced toluene equal to 38% of the xylene reacted. With silvered pumice the reaction temperature could be reduced to 625-650°C. with slightly higher yields of toluene being produced.

C. H. Riesz

Toluene ex Naphthas

Coulson, E. A. and Handley, R. PRODUCTION OF TOLUENE BY THE CRACKING OF SOLVENT NAPHTHA AND XYLOLES IN HYDROGEN. PART II. — EXPERIMENTS IN METAL REACTION TUBES, AND WITH INCREASE OF PRESSURE ABOVE ATMOSPHERIC. *J. Soc. Chem. Ind.* **65**, 398-402 (1946) *December.*

By means of silvered pumice catalyst contained in a stainless steel reaction tube, 40-50% yields of toluene were obtained from crude xylenes at 12 atmospheres pressure and 650°C. Passage of crude toluene at 675°C. over silvered pumice catalyst at atmospheric pressure can be utilized to remove non-aromatic constituents; total recovery of toluene was about 50% by weight of the crude vertical retort toluene charged.

C. H. Riesz

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7. ANALYTICAL METHODS AND TESTS

Alkylacetylenes Determination

Wagner, C. D., Goldstein, T., and Peters, E. D. DETERMINATION OF MONO- AND DIALKYLACETYLENES. *Anal. Chem.* **19**, 103-105 (1947) *February.*

A procedure is given for determining four and five carbon mono- and dialkylacetylenes in the presence of paraffins, olefins, or diolefins. The alkyne is quantitatively reacted with methanol in presence of mercuric oxide-boron trifluoride to form ketal which is hydrolyzed to ketone with sodium bicarbonate solution. The ketone produced is steam distilled into hydroxylamine hydrochloride solution. The liberated acid is titrated giving a measure of the ketone formed and, hence, the amount of sample alkyne.

M. C. Miyaji

Carbonization Tests

Brown, J. THE LABORATORY SCALE COAL CARBONIZATION ASSAYS. *Fuel (British)* **26**, 5-15 (1947) *January-February.*

The more important working details of the published laboratory scale assays are collected and reviewed. They are divided into the "differential cracking" type . . . the 1/1,000th-ton Assay Plant, Richardson's Assay — and the "Constant cracking" type, all of which latter employ tube retorts and are further divided into those which heat the coal in successive portions—Bauer, Schramm, Beilby, and Bone, Muschenborn, Litinsky, Koppers, United States Steel Corporation, Bruggemann, and Scheeben assays; all designated as the Bauer type—and those which heat the whole of the coal charge at the same time—Gray-King, Fuel Research Board and JB/UAL assays—all designated as the Gray-King type. Assays can be adjusted to match plant gas yields, but the yields of by-products deviate seriously from plant as gas production is increased to the level of gasworks. Their maximum utility is held to lie in the assay of the gas yield evaluated as gaseous thermal units. The Gray-King type of constant cracking assay is preferred since the heating schedule is simpler and no advantage is gained by the elaborate heating of the Bauer type. The Lessing Test merits further investigation. It is claimed that tube assays originated in England.

Author's abstract

Carbon Monoxide Determination

Shepherd, M. RAPID DETERMINATION OF SMALL AMOUNTS OF CARBON MONOXIDE. *Anal. Chem.* 19, 77-81 (1947) *February.*

This report furnishes briefly the requisite information for preparing and using the NBS Colorimetric Indicating Gel which is capable of detecting and estimating small or physiologically significant amounts of carbon monoxide in air. The gel will detect and estimate less than 1 part of carbon monoxide in 500,000,000 parts of air. In less than 1 minute it is possible to detect 0.001% by volume and in 1 minute to determine physiologically significant amounts. Untrained personnel can use reliably the convenient and inexpensive field apparatus described. For laboratory use, this gel will determine carbon monoxide within the range 0 to 0.01% with an accuracy of 0.0002%.

M. Nolt

Hydrogen Determination in Gasoil

Allen, C. ESTIMATION OF HYDROGEN CONTENT OF GASOILS. *Petroleum Refiner* 26, 116-118 (1947) *February.*

A method of calculating hydrogen content of gasoil is presented. Calculation depends upon empirical relations between density, refractive index, and molecular weight. Average accuracy is 0.3 per cent.

M. C. Miyaji

Sulfur Compounds in Petroleum

Haines, W. E., Wenger, W. J., Helm, R. V., and Ball, J. S. SULFUR IN PETROLEUM. II. BOILING POINTS, FREEZING POINTS, DENSITIES, AND REFRACTVE INDICES OF SOME SULFUR COMPOUNDS. *U. S. Bureau of Mines R. I.* 4060 (1946) *December.*

This report gives an introduction to the program of fundamental research instituted by the U. S. Bureau of Mines to deal with the problem of sulfur compounds found in petroleum and petroleum products. The first steps in the program were the identification of the various types of sulfur compounds to be found, and the tabulation of their physical properties. Tables are presented listing the sulfur compounds of each type which have been isolated, and giving their source, and methods used in their separation and identification. The types listed are thiols, disulfides, and sulfides which occur in straight-run distillates, together with thiophenes which occur in cracked products. The quantitative work done in estimating the thiols by molecular weight groups, and in the analyses of petroleum products for groups of sulfur compounds are summarized in tables. The authors include summaries of the nomenclature of the sulfur compounds occurring in petroleum, and of their methods of selecting the values of the properties listed in the tables of physical constants. 330 compounds are listed in these tables with their empirical formulas, boiling points (at three pressures), refractive indices and densities (at two temperatures), and with their freezing points.

C. Hummel

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8. GENERAL AND PHYSICAL CHEMISTRY

Equilibrium Compositions

Binkley, S. R., Jr. CALCULATION OF THE EQUILIBRIUM COMPOSITION OF SYSTEMS OF MANY CONSTITUENTS. *J. Chem. Phys.* 15, 107-110 (1947) *February.*

The writer describes a computational procedure for the calculation of the equilibrium position of systems of many constituents. A systematic procedure is developed for setting up the relations in a form suitable for computation, and iterative methods of solution are described.

Abstractor's note: The paper is a contribution to a badly neglected field of applied mathematics. However, its usefulness in the chemical field will be limited to the relatively few individuals who can cope with the formidable mathematical presentation. Its utility might be increased considerably by the inclusion of some representative calculations.

S. Katz

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9. ORGANIC CHEMISTRY

Catarole Process

THE CATAROLE PROCESS. *Chemical Industries* 60, 226-227 (1947) *February.*

A pilot plant with a liquid charging capacity of 0.8 tons per 24 hours consists of a vaporization coil, reactors packed with copper maintained at 630-680°C., condensers, separators and scrubbers. Relative proportions of gases and aromatic liquids depend upon the type and boiling range of feed stocks and operating conditions. Gases containing a high proportion of olefins constitute 50-63% by weight of the charge.

C. H. Riesz

Oxidation of Coal

Kinney, C. R. THE SOURCE OF ACETIC ACID OBTAINED BY OXIDATION OF COAL. *J. Am. Chem. Soc.* 69, 284-289 (1947) *February.*

The quantitative oxidation of coal to acetic acid shows that: (1) The structures in coal which yield acetic acid on oxidation are largely decomposed by carbonizing temperatures of 500°. (2) The yield of acetic acid from bituminous coals bears a direct relationship to the amount of methane produced on carbonization. (3) High rank coals give less acetic acid, the amount diminishing with the volatile matter content. (4) Woody portions of low rank coals give less acetic acid than the attrital portion. (5) High yields of acetic acid from synthetic carbohydrate-humic acids indicate that carbohydrates may have been an important factor in the formation of coals as well as lignin.

Author's summary

Oxo Process

ALCOHOLS ABOVE C_3 PRODUCED FROM OLEFINS, CO AND HYDROGEN. *Chemical Industries* 60, 232-233 (1947) *February.*

The German Oxo process for converting unsaturated hydrocarbons into alcohols is described briefly.

C. H. Riesz

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10. CHEMICAL ENGINEERING

Air Purification

Lobo, W. E. and Skaperdas, G. T. AIR PURIFICATION IN REVERSING EXCHANGERS. *Trans. Am. Inst. Chem. Engrs.* 43, 69-74 (1947) *February.*

The reversing exchanger has been used to remove water, carbon dioxide, and any other condensible impurities from air being processed in a liquefaction or fractionation plant. This paper describes the essential features of the reversing exchanger and of its operation. The mechanism of air purification by condensation of impurities on the exchanger surface, followed by removal of impurities by evaporation into one of the low-pressure products, after reversal of flows, is reviewed. The necessity of maintaining proper temperature differences is pointed out, and the "unbalanced-flow" operation, controlling temperature differences by recycling part of the nitrogen stream, is described. The harmful effect of entrained oil is

pointed out, and typical operating data are presented to illustrate the various features of the reversing exchanger. Finally, the reversing exchanger is compared with regenerators.

Authors' abstract

Binary Distillation

White, R. R. and Boyd, W. T. SPECIAL PROBLEMS IN BINARY DISTILLATION. *Petroleum Processing* 2, 73-78 (1947) *January.*

Last month the authors discussed analytical methods that could be used in the design of fractionating towers for calculating the number of theoretical plates required for a separation. The McCabe-Thiele method, Smoker's equation, and the Fenske or Underwood equation were all covered, and illustrated with examples. This month they discuss a few of the special applications of these techniques, including partial condensers, two-feed and three-feed columns, side streams, side stream recirculation, and low-temperature distillation. Previous articles in this series discussed the basic theory of binary distillation. Future articles will take up the design of towers, as well as multiple component, azeotropic and crude oil distillation.

Authors' abstract

Bubble Plate Column Design

White, R. R. BUBBLE PLATE COLUMN DESIGN. *Petroleum Processing* 2, 147, 149-150, 152-154 (1947) *February.*

Earlier articles in this series have covered the methods for calculating process variables in fractional distillation. This month the author progresses to some of the factors involved in the actual physical design of bubble plate columns, in which a primary consideration, he points out, is the provision of sufficient capacity for both liquid and vapor streams. Discussed are overall plate efficiencies, columnn diameter, vapor lines, liquid capacity, liquid height in downspouts, weirs, and liquid level on plates.

Editor's abstract

Chemical Pump Selection

Richardson, C. A. SELECTING CHEMICAL PUMPS. *Chem. Eng. Progress* 1, 17-20 (1947) *February.*

The centrifugal pump, the most common fluid moving equipment, is discussed from the standpoint of some of the more important construction details and operating factors to consider when choosing chemical pumps, particularly where both corrosive and abrasive liquids are to be handled. The materials of construction are not considered in this article, the remarks being limited to mechanical features and hydraulic conditions. The parts that are subject to the greatest corrosion and wear, mainly the casing, impeller, wearing rings, shaft sleeve and shaft are discussed in detail.

J. J. First

Fluid Catalytic Cracking

Thornton, D. P., Jr. FLUID "CAT CRACKER" DESIGNED TO USE NEW MS CATALYST. *Petroleum Processing* 2, 173-176 (1947) *March.*

Principal design features of the fluid catalytic cracking unit of the Houston Shell Oil Refinery are described. Improvements and material saving were achieved through special design using microspherical catalyst. Design economies resulted from use of feed preheater, making possible lower rate of catalyst circulation.

H. T. Inatomi

Fluidization

Kalbach, J. C. HANDLING SOLIDS—GAS REACTIONS BY FLUIDIZATION. *Chem. Eng.* 54, 136-138 (1947) *February.*

An earlier article (January 1947) laid some of the groundwork for the use of fluidization in chemical industry problems where the fluidized material itself enters into the reaction. Applications of this sort, such as coal gasification and lime calcination, are rapidly becoming of

interest, although all previous experience has been gained with fluidized solids used only as a catalyst. Following the general discussion of the first article, the present article carries on with the development of the main equations needed in producing data essential for design.

Author's abstract

Fluidized Retorting of Oil Shale

Blanding, F. H. and Roetheli, E. RETORTING OIL SHALE BY THE FLUIDIZED SOLIDS TECHNIQUE. *Oil Gas J.* 45, 84-88, 96 (1947) *February* 15.

An experimental pilot plant is described for studying the retorting of oil shale by the fluidization technique. Operating temperatures ranged from 850-1000°F. The reactor was a 10 ft. length of four inch tubing. The disengaging section diameter was 8 inches. Some heat was supplied internally by admitting some air with the steam.

J. D. Parent

Hydrocarbon Pyrolysis

Schutt, H. C. PRODUCTION OF ETHYLENE FROM ETHANE-PROPANE. *Chem. Eng. Progress* 43, 103-116 *"Trans. Section"* (1947) *March.*

A very extensive and thorough study of the factors affecting the design of the pyrolysis system and of the results of experimental and commercial installations is presented. Considerable operating data are given.

Abstractor's Comment: The length and the detail of this paper make it impractical to summarize, but it is recommended to those interested in moderate temperature hydrocarbon pyrolysis.

H. R. Batchelder

Jet Pumps

Kroll, A. E. THE DESIGN OF JET PUMPS. *Chem. Eng. Progress* 1, 21-24 (1947) *February.*

When a fluid is discharged from a nozzle or orifice, the stream becomes a jet pump for moving the fluid surrounding it. This is the principle of the jet pump, exhauster or ejector. In spite of the wide application of jet pumps in the chemical industries, readily usable design data are not available in the literature. This paper presents a simple method for the design of single stage steam and air operated jet pumps, having maximum efficiency for handling gases. For simplicity the correlations given in this paper are based on actual performance data and theoretical treatments are omitted.

J. J. First

Multistage Separation Processes

Benedict, M. MULTISTAGE SEPARATION PROCESSES. *Trans. Am. Inst. Chem. Engrs.* 43, 41-60 (1947) *February.*

Some of the newer separation processes are described and comparisons made with common processes of this class. Those considered are: Fractional Distillation, Absorption, Solvent Extraction, Extractive Distillation, Chemical Exchange, Thermal Diffusion, Gaseous Diffusion, Mass Diffusion and Gas Centrifuge. The general types of separation problems for which each method might be most suitable are discussed briefly.

H. R. Batchelder

Oxygen Production

Rushton, J. H. and Stevenson, E. P. DEVELOPMENTS IN OXYGEN PRODUCTION. *Trans. Am. Inst. Chem. Engrs.* 43, 61-68 (1947) *February.*

This paper gives a brief review of research on oxygen production carried on during the recent war for the Army and Navy under the supervision of the National Defense Research Committee of the Office of Scientific Research and Development. It is introductory to a group of papers each of which will give the design and operating performance of certain of the more important processes and equipment which were

developed. Flowsheets are given for a number of processes for the separation of oxygen from air by liquefaction and distillation. The significance of each process is pointed out and attention is called to the type of equipment necessary for successful operation under conditions of military use. The processes were used for oxygen producing plants for operation in aircraft, for airplane transportable units, for truck mounted units, and for ship and submarine installations. The smallest unit was for the production of 150 cu.ft. gaseous oxygen (S.T.P.) per hour. The largest unit built was for the production of 400 lbs. of liquid oxygen per hour. A 1000 cu.ft. per hour gaseous unit is representative of an intermediate size suitable for truck mounting.

Authors' abstract

Proportioning Pumps

McFarland, R., Jr. PROPORTIONING PUMPS—CONSTRUCTION, PERFORMANCE, AND APPLICATION. *Chem. Eng. Progress* 1, 12-16 (1947) *February.*

A variable stroke, positive displacement pump is a metering pump when it is pumping a single fluid. It is a proportioning pump when it delivers the fluid at a given ratio to one or more other fluids entering the system. Seven major design requirements which determine the success of a pump are the following: close clearance, accurate and rigid alignment, stuffing box design, packing design and selection, constructional material and selection, self purging properties and design of check valves. With the free acting check valve, the overall accuracy is usually well within 3 per cent. The pressure and capacity of a metering pump is varied by increasing or decreasing either or both the plunger size and the stroke length, the normal capacity range being a few tenths of a gallon per hour to approximately 3000 gallons per hour. Several methods of using metering pumps to measure small rates of flow are given; larger flows are measured by an appropriately sized differential pressure meter after the pulsations from a single acting duplex metering pump are smoothed out through the use of surge chambers and orifices. The author discusses instrument control, application of metering and proportioning pumps to a number of the more recently developed processes, factors to consider in the selection of pumps and maintenance and care of pumps.

J. J. First

Reservoir Engineering

Eilerts, C. K. GAS-CONDENSATE RESERVOIR ENGINEERING. 3. EQUILIBRIUM FACTORS, HYDRATES, AND CORROSION. *Oil Gas J.* 45, 100-103 (1947) *February* 15.

This is the third and last section of a treatment of certain reservoir engineering problems. Rather short discussions of phase equilibrium factors and corrosion control problems are included.

J. D. Parent

Steam-Jet Ejectors in Catalytic Cracking

Freneau, P., Kelso, G., and Hoge, A. W. APPLICATION OF STEAM-JET EJECTORS IN THE HOUDRY FIXED-BED CATALYTIC CRACKING PROCESS. *Trans. Am. Soc. Mech. Eng.* 69, 69-79 (1947) *January.*

The purpose of this paper is to discuss the fundamental theoretical aspects and the operation of the steam-jet ejectors which have been instrumental in maintaining the satisfactory performance of Houdry fixed-bed units. To the engineer, the data presented herein should be of particular importance because ejector design is generally not clearly understood and because the application of ejectors in the Houdry process is unique. Part 1 of the paper deals with the process itself, the principles of ejector design and operation, and details of Houdry unit air evacuators. Part 2 is devoted to a study of the application of ejectors of two other services in the Houdry process, viz., the evacuation of oil vapors during oil-purge periods and the maintenance of vacuum on the closed circulatory heat-transfer salt systems.

Excerpt from authors' abstract

Temperature Gradients in Turbulent Streams

Corcoran, W. H., Roudebush, B., and Sage, B. H. TEMPERATURE GRADIENTS IN TURBULENT GAS STREAMS. PRELIMINARY STUDIES. *Chem. Eng. Progress* 43, 135-142 *"Trans. Section"* (1947) *March.*

This is the first paper on what is apparently to be a continuous study, and covers principally a detailed description of the method and apparatus used, with results of a few experiments. It is intended to develop information concerning transfer of heat across turbulent streams.

H. R. Batchelder

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11. PROCESS EQUIPMENT AND INSTRUMENTATION

Distillation Drier

Gester, G. C., Jr. DESIGN AND OPERATION OF A LIGHT HYDROCARBON DISTILLATION DRIER. *Chem. Eng. Progress* 43, *"Trans. Section"* 117-122 (1947) *March.*

This paper describes the design and actual plant operation of equipment which reduces the water content of a hexane cut from 130 to less than 20 p.p.m. A brief resume is presented describing other equipment considered, and in one case actually tried, for the purpose of dehydrating dewaxing plant hexane. The prediction of vapor-liquid equilibrium data is described and a simplified flow diagram illustrates the column and its appurtenances. Plant data from this unit, which is capable of drying more than 65,000 lb./hr. of hexane substantiate the design bases and allow prediction of performance characteristics for future similar designs.

Author's abstract

Graphite Heat Exchangers

Ford, C. E. GRAPHITE HEAT EXCHANGERS. *Chem. Eng.* 54, 132-135 (1947) *February.*

In this, the second of two articles on the subject, the author discusses the design and operation of graphite heat exchangers. Several examples of impervious graphite tube heat exchanger ratings are presented through the cooperation of a number of leading fabricators of the equipment.

J. J. First

Turbo-Expanders

Swearingen, J. S. TURBO-EXPANDERS. *Trans. Am. Inst. Chem. Eng.* 43, 85-90 (1947) *February.*

Development of a turbine for efficient isentropic expansion of 7,050 lb./hr. of air at near-liquid air temperature is described. The relation borne by the various types of turbines to each other is clarified, and the reasons for the selection of a radial reaction-type turbine for this application are given. Curves are included for the prediction of efficiency at various conditions and capacities. The expander operates at 22,000 rev./min., has a 6⅞-in. diameter wheel and attains an efficiency of 82 per cent. It is of simple construction, inexpensive to build, represents good turbine practice for the particular application, attains gratifyingly high efficiency and, as indicated by 2,500 hours of trouble-free performance, is mechanically satisfactory. A turbo-expander for 12,500 lb. N_2/hr. built in Germany for the Gesellshaft fur Linde's Eismaschinen, A. G., recently investigated, is described in detail. A claim is made of 65 per cent efficiency. Two other sizes made by them are described also.

Author's summary

Vacuum Micromanometer

Young, W. S. and Taylor, R. C. VACUUM MICROMANOMETER. *Anal. Chem.* 19, 133-135 (1947) *February.*

A vacuum gage operating on the manometric principle is particularly suited to the pressure range of 10^{-1} to 10^{-3} mm. of mercury. Readings are independent of both the physical properties of the gas and the presence of condensables in a gas mixture. At present it is finding application in the field of mass spectrometry and in rapid molecular weight determinations of volatile liquids.

Authors' abstract

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12. MATERIALS OF CONSTRUCTION

Corrosion Resistant Alloy

CORROSION RESISTANCE OF 27% CHROME ALLOY RECORDED HIGH IN PLANT SERVICE TESTS. *Petroleum Processing* 2, 116-117, 119, 122 (1947) *February.*

Suggestions for the more effective commercial use of 27% chromium-iron alloy by petroleum refiners and in other high temperature catalytic reactions are given in a report based on 30 metallurgical studies made by several oil companies and the Babcock and Wilcox Tube Co. for the Office of Rubber Reserve. The relative chemical inertness of this alloy under alternate oxidizing and reducing conditions is a valuable property but a certain loss of ductility under high temperature conditions necessitated various recommendations concerning fabrication, welding repairs, maintenance and operating practice. These were made in the report. The conditions of use in the catalytic dehydrogenation process for the manufacture of butadiene are temperatures of 900 to 1500°F., alternate oxidizing and reducing conditions and the necessity of keeping the reaction chamber free of iron and iron oxide dust which has undesirable catalytic effects. Under these conditions it was established that the 27% chromium alloy best resisted dust formation and its oxidation rate was negligible and of the same order as that of the higher chromium nickel steels.

J. J. First

Pipeline Protection

McRaven, C. H. CATHODIC PROTECTION. *Petroleum Eng.* 18, 148, 150, 152, 154 (1947) *February.*

Most corrosion taking place in pipelines in contact with the soil may be prevented by the use of a cathodic protection unit. The article describes this unit; tells where to place it; how much external voltage is required in each case; and the instruments used to make these measurements. Networks of circuits set up in this unit and also the effect of this protected pipeline upon any other pipeline in the near vicinity of it are described.

S. Mori

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13. NEW BOOKS

Air Conditioning

Herkimer, H. and Herkimer, H. AIR CONDITIONING. *Brooklyn, Chemical Publishing Co.*, 1947.

Subject matter has been carefully selected to give well-balanced and systematic training to students of air conditioning engineering, and to help engineers and technical men to solve their problems in designing and repairing equipment, selecting materials and estimating costs. The book is replete with problems and their solutions, tables and illustrations.

Explosion and Combustion in Gases

Jost, W. (Translated by H. O. Craft). EXPLOSION AND COMBUSTION PROCESSES IN GASES. *New York, McGraw-Hill*, 1946.

Few books on this important subject exist in the English language, and this translation of

Jost's classic monograph is a welcome addition to the literature. Although first published in 1935, it is still among the most recent important books in the field of combustion. The book has been written with consideration of the needs of chemists and physicists as well as engineers, and considerable elementary material is included to meet the needs of all three classes of readers. Theory is treated thoroughly, however, and is well balanced with experimental data. In the highly controversial field of combustion mechanism, the author strikes an unusually fair balance between his own and rival theories. The topics include initial stages of explosions, propagation of explosions, explosions in closed chambers, detonation, flames, kinetics of combustion and explosion processes, with separate sections on hydrogen, carbon monoxide and hydrocarbon combustion, spark ignition, and combustion in the Otto and Diesel engines. The book is well printed and the translation is very readable. The publishers' unfortunate allusion to the book as a publication in "Aeronautical Science" should not discourage chemists and combustion engineers to whom the book should be of great value.

S. Katz

Fuels and Fuel Burners

Steiner, K. FUELS AND FUEL BURNERS. *New York, McGraw-Hill,* 1946.

This presents a comprehensive compilation of the nature, occurrence and properties of fuels from the viewpoint of domestic and commercial heating, and the design, construction, installation, and operation of stokers, oil burners, and gas burners used in heating plants. A feature is the rather complete discussion of automatic control methods and apparatus for heating systems, including conventional electrical types and the more recent electronic developments.

Petroleum Research

American Petroleum Institute. FUNDAMENTAL RESEARCH ON OCCURRENCE AND RECOVERY OF PETROLEUM. *New York, American Petroleum Institute,* 1946.

This contains the results of fundamental research studies on the occurrence and recovery of petroleum sponsored by API for the years 1944-1945. Many of the papers included have already appeared in various scientific periodicals. In addition to these papers, brief reports from the directors of the projects are included.

R. S. Goodrick

Refrigeration Applications

American Society Refrigerating Engineers. THE REFRIGERATING DATA BOOK. REFRIGERATION APPLICATIONS. *New York, American Society Refrigerating Engineers,* 1946.

In this book are discussed the applications of refrigeration in: (1) Frozen Foods; (2) Cold Storage Practice; (3) Food Manufacture; (4) Food Distribution; (5) Low Temperature Applications; (6) Industrial Applications; (7) Comfort Air conditioning; (8) Industrial Air Conditioning.

R. S. Goodrick

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